Pharmaceutics

The Effectiveness of Using Rapid Shallow Breathing Index as a Weaning Parameter on Mechanically Ventilated Patients

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Abstract		**Original Research Article**

This study determined the effectiveness of using RSBI as a weaning parameter on mechanically ventilated patients at Veterans Memorial Medical Center from January – December 2016. The descriptive research design was employed using data from the Pulmonary Laboratory of the Department of Medicine, which involved 204 admitted patients. Majority of them are aged 71 (74.0%), males (54.4%) and were admitted in MICU (34.3%) and MITU (34.3%). Results revealed that the majority of the patients passed the RSBI breathing index (62.7%) wherein most of them had successful T-piece weaning and extubation (63/128). This study unveiled the significant relationship between age (0.002), sex (0.033), and their RSBI results. Hence, the RSBI breathing index is an effective parameter for weaning mechanically ventilated patients. It is therefore recommended that physicians utilize the RSBI breathing index to monitor the conditions of their patients. Further, it is also suggested to explore other procedures to supplement the RSBI breathing index to confirm the conditions of patients. Parallel studies may also be conducted to explore other variables to assess and evaluate the effectiveness of RSBI breathing index.
Keywords: RSBI; weaning parameter; mechanically ventilated patients; Descriptive; Philippines.

INTRODUCTION

Readiness testing is the evaluation of objective clinical criteria in order to decide whether a patient is ready to begin the process of discontinuing mechanical ventilation. Weaning is the process of decreasing ventilator support and allowing patients to assume a higher proportion of their ventilation. It may involve either an immediate shift from full ventilatory support to a period of breathing without assistance from the ventilator. Regardless of which approach, extubation is considered once the patient demonstrates the ability to breathe without the ventilator [1].

Some clinicians use physiological tests, known as weaning predictors, to predict whether a patient is ready because they are hesitant to begin weaning on the basis of clinical criteria alone. Weaning indices to predict the outcomes such as weaning failure and reintubation are commonly used by physicians in decision making. The Rapid Shallow Breathing Index (RSBI) is one of the best studied and most commonly used weaning predictors. A Wright's spirometer is connected to the endotracheal tube and left for 60 seconds to calculate for RSBI using the traditional method. Minute ventilation is divided by respiratory rate and then multiplied by 1000, and then the respiratory rate is divided by tidal volume in liters, to calculate the spontaneous tidal volume. According to the American Association for Respiratory Care (AARC), the RSBI formula is an objective method by which a patient is considered ready to be weaned off of a ventilator. An RSBI < 105 breaths/min/L has been widely accepted by healthcare professionals as a criterion for weaning to extubation. Whereas patients with RSBI > 105 will have a high chance of failure and require re-intubation [2].

Physicians frequently order such a test for mechanically ventilated patients at Veterans Memorial Medical Center. It is manually measured using a Wright's Spirometer wherein a patient's spontaneous breath is recorded for one minute by connecting the device to the endotracheal tube and coaching the patient to breathe at his own phase and effort. One can also compute the actual Tidal Volume of a patient from this procedure. Physicians decide a Spontaneous Breathing Trial and extubation after having the RSBI result. Hence, this research aims to assess the effectiveness of using RSBI as a weaning parameter on mechanically ventilated patients.

MATERIALS AND METHODS

Research Design
This study utilized a descriptive method of research to gather relevant RSBI data of intubated patients of Veterans Memorial Medical Center that was beneficial for the study.

Locale and Duration of the Study
This research evaluated the RSBI data from the records of the Pulmonary Laboratory of Veterans Memorial Medical Center in Quezon City from January 2016 to December 2016.

Respondents
The respondents were 204 patients admitted in different ICUs of VMMC from January - December 2016. Physicians ordered RSBI measurements as an additional indicator of their weaning parameters.

Data Gathering
Permission to conduct the study was sought from the Center. Upon approval, the age, sex, and type of ICU of every respondent were recorded. RSBI were collected using the Wright's Spirometer wherein an intubated patient was subjected to spontaneous breathing for 1 minute. The spirometer was attached to the artificial airway or endotracheal tube. While the patient was breathing, the spirometer then was used in measuring the minute ventilation of patient while the respiratory therapist counts the number of breaths also known as the respiratory rate the patient generated in the span of 1 minute. Spontaneous V_T was calculated by dividing minute ventilation by respiratory rate, and the RSBI was calculated by dividing the respiratory rate by V_T in liters.

Data analysis
The data gathered were tabulated and analyzed using the following statistical tools: frequency and percentage to determine the demographic profile of the patients, RSBI results of patients, and T-piece weaning and extubation of patients; Pearson Product of Correlation to determine the significant relationship between the demographic profile and RSBI results, and t-test for the significant difference between the demographic profile and RSBI results of patients.

RESULTS AND DISCUSSION
It can be gleaned on Table 1 on the Demographic Profile of Patients that majority of the patients or 151 (74.0%) out of 204 patients admitted in VMMC are 71 years old and above, 34 (16.75) are aged 61 – 70 years old, 15 (7.4%) belong to the 51 – 60 age group and 4 (2.0%) are aged 30 – 40 years old. More than half or 111 (54.45%) out of 204 patients are males, and 93 (45.6%) of them are females. As to type of Intensive Care Unit (ICU) where the patients were admitted in VMMC, 34.3% (70) where admitted in the Medical ICU (MICU), also 34.3% (70) were admitted in the Medical Intensive Treatment Unit (MITU), 21.6% (44) were admitted in the Pulmonary ICU (PICU) and 9.8% (20) were admitted in the Surgical ICU (SUCI).

Table-1: Demographic profile of patients

AGE	Frequency	%
30 – 40	4	2.0
51 – 60	15	7.4
61 – 70	34	16.7
71 and above	151	74.0
Total	204	100.0
SEX		
Male	111	54.4
Female	93	45.6
Total	204	100.0
TYPE OF ICU		
Surgical ICU	20	9.8
Pulmonary ICU	44	21.6
Medical ICU	70	34.3
Medical Intensive Treatment Unit	70	34.3
Total	204	100.0

As seen in Table 2 on the RSBi Results of Patients, the study revealed that out of 204 patients, 128 (62.7%) have breathing index less than 105 breath/minute/liter which means that they passed and that they are candidates for weaning and extubation. On the other hand, 76 (37.3%) of them have breathing index of more than 105 breath/minute/liter, which implies that weaning is not recommended.

Table-2: RSBI results of patients

RSBI	Frequency	%
Passed	128	62.7
Failed	76	37.3
Total	204	100.0

Based on Table 3 on the T-piece Weaning and Extubation of Patients revealed that 63 out of 128 patients with passing RSBI had undergone successful T-piece weaning and extubation. Likewise, 24 out of 128 patients with passing RSBI though did not undergo T-piece weaning but were extubated were considered successful.

Table-3: T-piece weaning and extubation of patients

RSBi			EXTUBATION		Total
			Yes	No	
Passed	T-PIECE	Yes	63	11	74
		No	24	30	54
	Total		87	41	128
Failed	T-PIECE	Yes	9	3	12
		No	4	60	64
	Total		13	63	76
Total	T-PIECE	Yes	72	14	86
		No	28	90	118
	Total		100	104	204

It can be observed in Table 4 on the Relationship between the Demographic Profile of the Patients and their RSBi Results that age (0.002) and sex (0.033) are positively correlated with their RSBi results. This means that older and male patients have more possibilities of having passing RSBi results.

Table-4: Relationship between the demographic profiles of the patients

DEMOGRAPHIC PROFILE		RSBi
AGE	Pearson Correlation	.216[**]
	Sig. (2-tailed)	.002
SEX	Pearson Correlation	.150[*]
	Sig. (2-tailed)	.033
TYPE OF ICU	Pearson Correlation	-.123
	Sig. (2-tailed)	.080
RSBi	Pearson Correlation	1
	Sig. (2-tailed)	

As seen in Table 5 on the Difference between the Demographic Profile of the Patients and their RSBI Results revealed that there is a significant difference between the age and their RSBI results. Likewise, a significant difference is also noted between sex and their RSBI results. On the contrary, type of ICU where the patients were admitted has no significant difference with their RSBI results.

Table-5: Difference between the demographic profile of the patients and their RSBI results

		t-test for Equality of Means						
		T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
AGE	Equal variances assumed	-3.148	202	.002	-.352	.112	-.573	-.132
	Equal variances not assumed	-3.481	199.610	.001	-.352	.101	-.552	-.153
SEX	Equal variances assumed	-2.152	202	.033	-.154	.072	-.295	-.013
	Equal variances not assumed	-2.142	155.385	.034	-.154	.072	-.296	-.012
TYPE OF ICU	Equal variances Assumed	1.759	202	.080	.247	.140	-.030	.524
	Equal variances not assumed	1.831	177.451	.069	.247	.135	-.019	.513

CONCLUSION

Overall, based on the results, RSBI is still an effective indicator for weaning mechanically ventilated patients. This is because out of 128 patients with passing RSBI results, 63 of them were successfully weaned and extubated as compared to 11 patients who were not successfully weaned and extubated.

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